INITIAL SITE INVESTIGATION REPORT
of the
DAVIDSON PROPERTY

South Ryegate, Vermont

25 July 1996

Prepared for:

Mr. Winston Doe (Estate Executor)
RR #1 P.O Box 11A
South Ryegate, VT 05069
Phone: 802-584-3677

Prepared by:

Ground Water of Vermont
1 Mill Street, Box C-5
Burlington, VT 05401

Contact: Bruce Hamilton
Phone: 802-860-6065

GWV Project #V96-030
GWV Document #96030R02.SAM

TABLE OF CONTENTS

Executive Summary

Ground Water of Vermont (GWV) has conducted an initial site investigation regarding a former residential heating-oil underground storage tank (UST) at the Davidson Property on Stone Road in South Ryegate, Vermont. Field investigations following removal of the UST included the installation of three soil borings / monitoring wells, field screening of subsurface soils for the presence of volatile organic compounds (VOCs), sampling and analysis of ground water from the monitoring wells and the on-site supply well, and a site survey for the purposes of identifying and assessing potential risks to environmental and human health.

GWV's conclusions are summarized as follows:

1. Heating oil released from a 2,000-gallon single-walled steel UST has impacted underlying soil and ground water. The UST was removed from the ground on 5 June 1996. No evidence of additional and/or ongoing sources of contamination have been identified.
2. Soil-screening results from three soil borings performed at the site on 2 July 1996 suggest that the soil-contaminant plume does not extend beyond the area immediately surrounding the UST closure site.
3. The residual ground-water contamination at the site appears to be limited both in degree and extent. Analytical results from ground-water samples collected from three monitoring wells at the site and from the on-site residential supply well indicate that contaminant concentrations in ground water at the site do not exceed Vermont Groundwater Enforcement Standards for petroleum compounds, and that the area of ground-water contamination is also limited to the immediate vicinity of the former UST location.
4. Nearby sensitive receptors include an on-site bedrock supply well, numerous (estimated to be as many as ten) off-site residential supply wells, the basement of the on-site residence, and Stone Road Brook.
5. Surficial materials at the site consist of poorly sorted sand and gravel with traces of silt to a depth of four feet underlain by varying depths of gray, glacial till material (with traces of gravel) overlying bedrock. On 2 July 1996, the water table was found to be about three feet below ground surface, and exhibited an east trending gradient of about 10.0%. Ground-water flow velocities are expected to be between 0.001 and 0.28 feet per day.

On the basis of these conclusions, GWV recommends the following:

1. One additional sampling event to include analysis of samples from the three on-site monitoring wells and the on-site supply well for BTEX by U.S. EPA Method 8020.
2. The results of the additional monitoring study should be used to evaluate the need for additional investigation and/or continued ground-water monitoring at the site.

1.0 INTRODUCTION

This report details the results of an initial site investigation conducted at the Davidson Property located on Stone Road (TH #5) in Ryegate, Vermont (Figure 1). This report has been prepared by Ground Water of Vermont (GWV) for the estate executor, Winston Doe. The site investigation was initiated with Vermont Department of Environmental Conservation (VT DEC) approval under the State's "expressway" notification process following the discovery of subsurface petroleum contamination during the removal of a 2,000-gallon residential heating-oil underground storage tank (UST) on 5 June 1996.

1.1 Site Location and Physical Setting

The site is located about 200 feet off Old Rt. 302 along the western edge of the Stone Road (TH #5) in the town of Ryegate (Figure 1 in Appendix A). The site is bordered to the southwest by a steep embankment and lies approximately 80 feet west of a tributary of the Wells River referred to as the Stone Road Brook. The area is a mixture of scattered residential development and inactive commercial mining operations. Surface drainage and presumed ground-water flow in the area generally follow the topographic slope toward the aforementioned tributary.

Drinking water at the site and all surrounding properties is supplied by private wells, some of which are shallow, dug wells. The on-site supply well is a drilled bedrock well located approximately 55 feet northeast of the residence and slightly up-gradient of the former UST location. No other residences are located in the immediate vicinity of the Davidson property. Approximately ten other residential water supply wells are located within one-half mile of the site (Figure 1 in Appendix A).

The site and all neighboring buildings are served by individual private wastewater disposal systems.

Native surficial materials in the vicinity of the site are mapped as glacial till (Stewart and MacClintock, 1970). Bedrock underlying the site is mapped as Waits River formation (Doll, 1961); which consists of gray quartzose and micaceous crystalline limestone that weathers to a distinctive brown earthy crust.

1.2 Site History

The site consists of one residential dwelling, attached garage and a small utility shed. The residence is currently unoccupied but previously was a portion of the CR Davidson Granite Co. property, which closed approximately two years ago after more than 30 years of operation. Winston Doe, the guardian for Muriel Davidson (the surviving spouse) serves as the executor and representative of the estate.

The UST was removed on 5 June 1996 by W. E. Jock Oil of Wells River, Vermont. A GWV field geologist performed an UST closure assessment on the day of removal, and submitted a report, dated 14 June 1996, to Mr. Doe and the VT DEC.

The UST was found to be in poor condition upon removal, with extensive surface rust and pitting, and at least two holes ranging from 1/16 to 1/4-inch in diameter. All of the observed holes appeared to be above the water table, which was approximately three feet below ground surface (bgs) in the tank excavation. Petroleum odors, stained soils, sheens and evidence of free product on the water table were observed within the excavation. The UST piping, however, appeared to be in good condition. About 30 gallons of residual heating oil and tank bottoms were removed from the UST and stored on-site in a 55-gallon drum for subsequent disposal. Due to the presence of contamination at the water table, all soils were backfilled.

GWV initiated a site investigation in accordance with the VT DEC "expressway" process after receiving approval on 5 June 1996 from Mr. Doe and Tim Cropley of the VT DEC.

1.3 Objectives and Scope of Work

The objectives of this initial site investigation were to:

- Evaluate the degree and extent of petroleum contamination in soil and ground water;
- Qualitatively assess the risks to environmental and public health via relevant sensitive receptors and potential contaminant migration pathways; and
- Identify potentially appropriate monitoring and/or remedial actions based on the site conditions.

To accomplish these purposes, GWV has:

- Reviewed existing historical site data.
- Supervised the installation of two additional soil borings / monitoring wells (MW-2 and 3), and determined the local ground-water flow direction, gradient and approximate velocity.
- Screened subsurface soils from the well borings for VOC content using a PID.
- Collected and submitted ground-water samples from the on-site monitoring wells and from the shallow on-site supply well for laboratory analysis of VOCs and total petroleum hydrocarbons (TPH).
- Identified sensitive receptors in the area, and assessed the risk posed by the contamination to these potential receptors.
- Evaluated the need for treatment and/or a long-term monitoring plan for the site.
- Prepared this summary report, which details the work performed, qualitatively assesses risks, provides conclusions and offers recommendations for further action.

2.0 INVESTIGATIVE PROCEDURES AND RESULTS

2.1 Soil Boring / Monitoring Well Installation

On 2 July 1996, GWV supervised the installation of two soil borings / monitoring wells (MW-2 and MW-3) at the site. MW-1 had been previously placed within the former UST location at the time of tank closure activities. MW-2 was placed about 25 feet north of the former UST location in the presumed oblique downgradient direction, toward the Stone Road. MW-3 was located an equal distance from the former UST location in the presumed downgradient direction. Well locations are shown on Figure 2 in Appendix A. The monitoring wells were installed by Adams Engineering of Underhill, Vermont using vibratory drilling techniques to both advance the borings and emplace the wells.

Monitoring well #2 and #3 borings were completed to a depth of 8.5 feet and 11.5 feet, respectively. Continuous soil samples were collected at each monitoring-well boring location using a five-foot polyethylene-lined core barrel with a 2.375 -inch inner diameter. The core barrel, which also served as the drill bit with an outer diameter of 4.0 inches, was simultaneously pushed and vibrated into place to advance the boring. The sample cores obtained were screened for the possible presence of volatile organic compounds (VOCs) with a photo-ionization detector (PID) and logged for lithology by GWV personnel. All downhole drilling equipment was decontaminated and the polyethylene core barrel liner changed between borings.

The unconsolidated overburden encountered in each boring generally consisted of up to four feet of poorly sorted dark brown sand and gravel with traces of silt overlying from 2 to 4.5 feet of gray glacial till material with traces of gravel. Soil samples collected from the MW-3 boring showed evidence of significant petroleum staining but exhibited no petroleum odor. Detailed stratigraphic soil descriptions are included on the boring/well logs in Appendix B. Drilling refusal, presumably at bedrock, was encountered in the MW-3 boring at a depth of 8.5 feet bgs.

Ground water was encountered in both borings at about three to four feet below ground surface. A monitoring well was installed in each soil boring by vibrating a two-inch diameter PVC well point into the open hole left by the core barrel. A 5-foot section of 0.010-inch slot high-flow screen was placed such that approximately two feet of screen extended above the apparent water table. Solid two-inch diameter PVC riser extended from the top of screen to approximately 0.5 feet below ground surface. Clean quartz #1 filter sand was placed in the open annulus around the well to at least 0.5 feet above the top of the screened interval. A bentonite seal at least one-foot thick was installed above the sand pack and the remainder of the annular space was filled with native material. Each completed monitoring well was protected by a flush-mounted steel roadbox to be cemented in place. Monitoring-well construction details are included on the boring/well logs in Appendix B.

Wells MW-2 and MW-3 were developed immediately after construction using a peristaltic pump. MW-1 was manually developed by bailer following installation of MW-2 and MW-3.

None of the wells contained free-phase product at that time. All three wells produced moderate amounts of water and cleaned up relatively quickly. Development water was discharged directly to the ground surface in the vicinity of each well.

2.2 Soil-Screening Results

PID field-screening results of soil samples collected from the two soil borings indicate that residual soil contamination remains confined to the former UST location. With the exception of elevated reading as high as 144 parts per million (ppm) in samples collected from below the water table in the UST excavation, all samples had PID readings of less than 4 ppm, which is below the VT DEC PID-based guideline value for fuel-oil contaminated soils of 10 ppm. PID screening results are included on the boring logs in Appendix B.

The GWV field geologist screened soil samples from each soil boring for the possible presence of volatile organic compounds (VOCs) using a Thermo Environmental Model 580B portable photoionization detector (PID). The PID was calibrated with an isobutylene standard gas to a benzene reference.

2.3 Determination of Ground-Water Flow Direction and Gradient

Ground water in the unconfined surficial aquifer directly beneath the site appears to be flowing in an easterly direction, as originally presumed. The average gradient of the local ground-water table on 2 July 1996 was about 10.0 percent. Average flow velocities in the ground water are estimated to be in the range of 0.001 to 0.28 feet per day. Water-level measurements and elevation calculations for 2 July 1996 are presented in Table 1. The ground-water contour map in Figure 3 was prepared using this data.

Fluid levels were measured in the three monitoring wells on 9 July 1996. The depth to water varied from 2.64 feet (MW-2) to 4.64 feet (MW-3) below top-of-casing. No free-phase petroleum was observed in any of the wells although a sheen was noted in ground water samples taken from MW-1. Static water-table elevations were computed for each monitoring well by subtracting the measured depth-to-water readings from the surveyed top-of-casing elevations, which are relative to an arbitrary site datum of 100.00 feet.

The glacial till materials comprising the shallow aquifer at the site typically exhibit effective porosities of about 0.1 to 0.2 and hydraulic conductivities of about 0.0028 to 0.28 feet per day (Fetter, 1994). Assuming Darcian flow, these estimated ranges of porosity and conductivity combine with the calculated ground-water gradient of 10.0 percent to yield an estimated range of ground-water flow velocity in the surficial aquifer of between 0.001 and 0.28 feet per day.

2.4 Ground-Water Sampling and Analysis

Ground-water analytical results suggest that residual ground-water contamination at the site is limited both in degree and extent. None of the ground-water samples collected from the on-site monitoring wells exceeded any Vermont Ground Water Enforcement Standards (VGESs) for petroleum compounds.[1] The highest contaminant concentrations were detected in the well in the former UST location (MW#1). Both the down-gradient and cross-gradient wells (MW#3 and MW#2, respectively) did not show any contamination. These results suggest that residual ground-water contamination is largely confined to the immediate source area at levels below VGESs. Analytical results are summarized in Table 2. A contaminant distribution map of total BTEX, MTBE and TPH is presented as Figure 4. Laboratory report forms are included in Appendix C.

Analysis of the sample collected from MW-1 identified the presence of: xylenes - 4.3 parts per billion (ppb), ethyl benzene - 1.9 ppb, toluene - 7.9 ppb, and TPH - 1.48 parts per million (ppm). Contaminants were detected in samples obtained from the remaining monitoring wells or the on-site supply well.

Ground-water samples were collected from monitoring wells MW-1, 2 and 3 and from the on-site residence supply well on 2 July 1996. Each monitoring well was purged and then sampled using the dedicated bailer and dropline left hanging inside the well casing following development. The water-supply well was sampled directly, also with a disposable bailer. Trip blank and duplicate samples were collected to ensure that adequate quality assurance/quality control (QA/QC) standards were maintained. All field procedures were conducted in accordance with GWV standard protocols. Purge water was discharged directly to the ground in the vicinity of each well.

The ground-water samples were submitted to Endyne, Inc. of Williston, Vermont where they were analyzed for the possible presence of VOCs by EPA Method 8020 and for total petroleum hydrocarbons (TPH) by modified U.S. EPA Method 8100. Analytical results from the QA/QC samples indicate the possibility of a confounding contaminant source during either sample collection, transport or analysis. Toluene was detected in the trip-blank sample at a concentration of 1.4 ppb., ethylbenzene at 1.1 ppb and xylenes at 3.8 ppb. The trip blank had been collected from a newly-opened gallon bottle of commercially-available distilled water prior to going into the field, and had remained in the cooler throughout the sample-collection and transport process. GWV and Endyne's review of possible causes of this result suggests that the distilled water became contaminated prior to sample collection. Laboratory personnel reported that the chemical signature of compounds found in the trip blank does not match that found in the monitoring well sample (which had a fuel-oil signature). On the basis of this, we believe that the contaminants detected in the MW-1 sample are indicative of actual ground-water quality.

---

[1] Vermont has established Groundwater Enforcement Standards (VGESs) for four fuel-oil VOCs, as follows: benzene - 5 ppb; toluene - 2,420 ppb; ethylbenzene - 680 ppb; and xylenes - 400 ppb. No Vermont or Federal ground-water standard has been established for TPH.

Analytical results for the 8020 duplicate ranged from about thirty percent to fifty-six percent of the original sample results. A duplicate study was not performed for the TPH analysis.

3.0 SENSITIVE RECEPTOR SURVEY AND RISK ASSESSMENT

GWV conducted a survey to identify sensitive receptors near the former UST location that could potentially be impacted. The following sensitive receptors were identified:

1. The on-site supply well provides drinking water for the Davidson property and is located about 55 feet upgradient of the former UST. No neighboring residential supply wells were identified in the immediate vicinity of the former UST. The nearest off-site wells are located approximately 200 feet radially from the former UST location.
2. The on-site residence has a subsurface basement located immediately adjacent to the former UST location.
3. The nearest surface-water body is the Stone Road Brook, located approximately 80 feet to the northeast. This stream presumably represents the surface discharge point of ground water that flows past the site.

GWV assessed the risks that the subsurface contamination poses to these receptors, and has concluded that the residual contamination at the site does not pose a significant threat to any known sensitive receptors. This conclusion was based on the following:

- The only known contaminant source has been removed from the ground;
- None of the ground-water samples from the monitoring wells exceeded VGESs or Vermont drinking-water standards;
- No contaminants were detected in the on-site supply well;
- No odors or seeps were identified in the basement of the on-site residence, and a PID reading of ambient air in the basement was 0.0 ppm on 5 June 1996;
- No contaminants were detected in the monitoring well located 25 feet directly downgradient from the former UST.

4.0 CONCLUSIONS

Based on the results of the site investigation described above, Ground Water of Vermont concludes the following.

1. Heating oil released from a 2,000-gallon single-walled steel UST has impacted underlying soil and ground water immediately adjacent to the former UST. The UST was removed from the ground on 5 June 1996. No evidence of additional and/or ongoing sources of contamination have been identified.

2. Soil-screening results from two soil borings performed at the site on 2 July 1996 suggest that the contamination is largely confined to the area immediately surrounding the former UST location.

3. The residual ground-water contamination at the site appears to be limited both in degree and extent. Analytical results from ground-water samples collected from three monitoring wells at the site and from the on-site residential supply well indicates that contaminant concentrations in ground-water at the site do not exceed Vermont Groundwater Enforcement Standards for petroleum compounds, and that the area of ground-water contamination is limited to the immediate vicinity of the former UST location.

4. Nearby sensitive receptors identified during the investigation include the on-site supply well, as many as ten off-site residential water supply wells, the basement of the on-site residence and Stone Road Brook. Given the limited degree and extent of soil and ground-water contamination and the fact that the UST (the source of the contamination) has been removed, the residual subsurface contamination at the site does not appear to pose a significant threat to any of these sensitive receptors.

5. Surficial materials at the site generally consisted of up to four feet of poorly sorted dark brown sand and gravel with traces of silt overlying from 2 to 4.5 feet of gray glacial till material with traces of gravel overlying bedrock. On 2 July 1996, the water table was found to be about three feet below ground surface, and exhibited an easterly trending gradient of about 10.0%. Ground-water flow velocities are expected to be between 0.001 and 0.28 feet per day.

5.0 RECOMMENDATIONS

On the basis of the results of this investigation and the conclusions stated above, Ground Water of Vermont recommends the following:

1. One additional sampling event to include analysis of samples from three on-site monitoring wells and supply well for BTEX by U.S. EPA Method 8020.
2. The results of this additional monitoring study should be used to evaluate the need for additional investigation and/or continued ground-water monitoring at the site.

6.0 REFERENCES

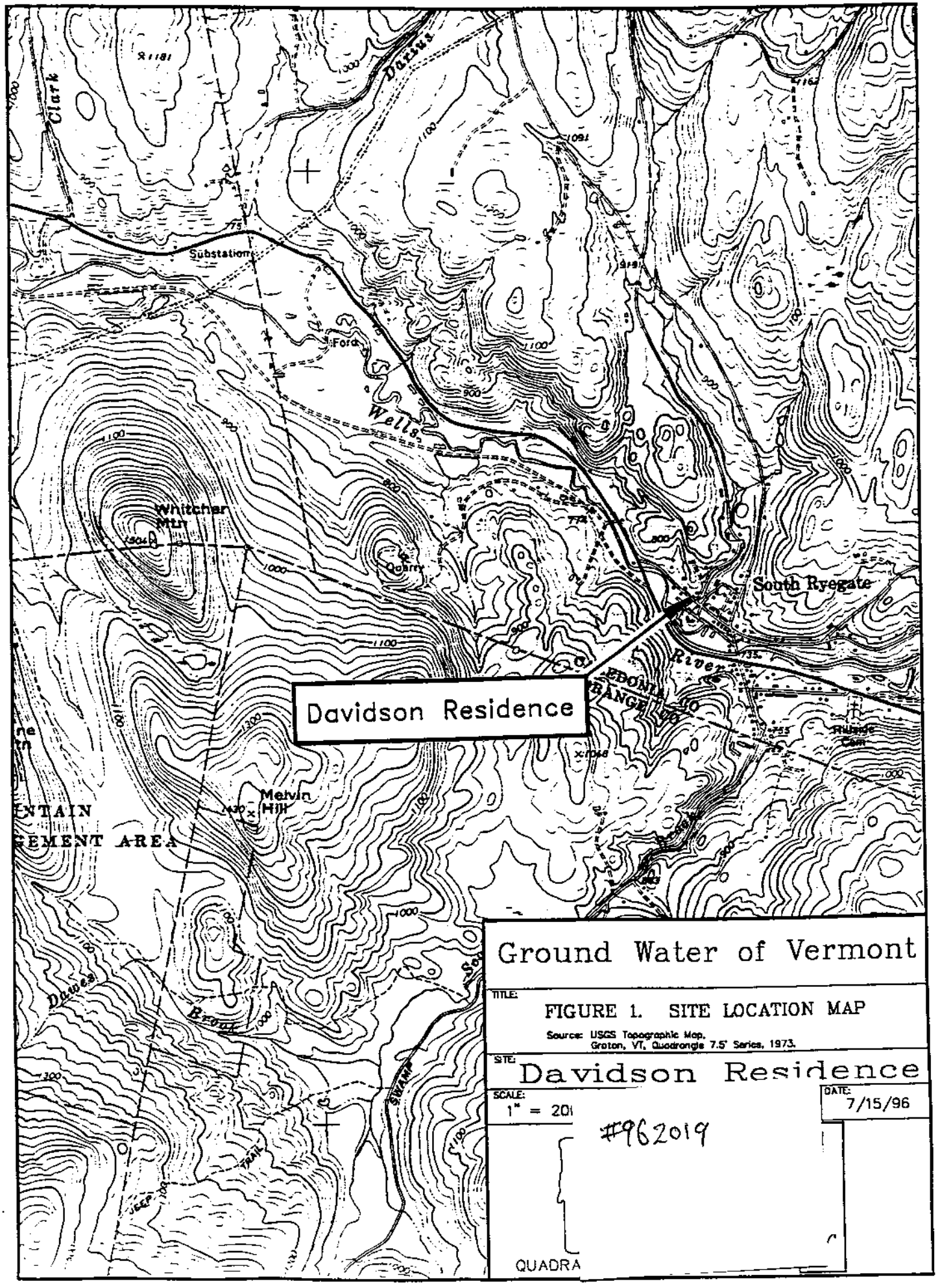
Doll, C.G. and others, 1961. *Geologic Map of Vermont*, Office of the State Geologist.

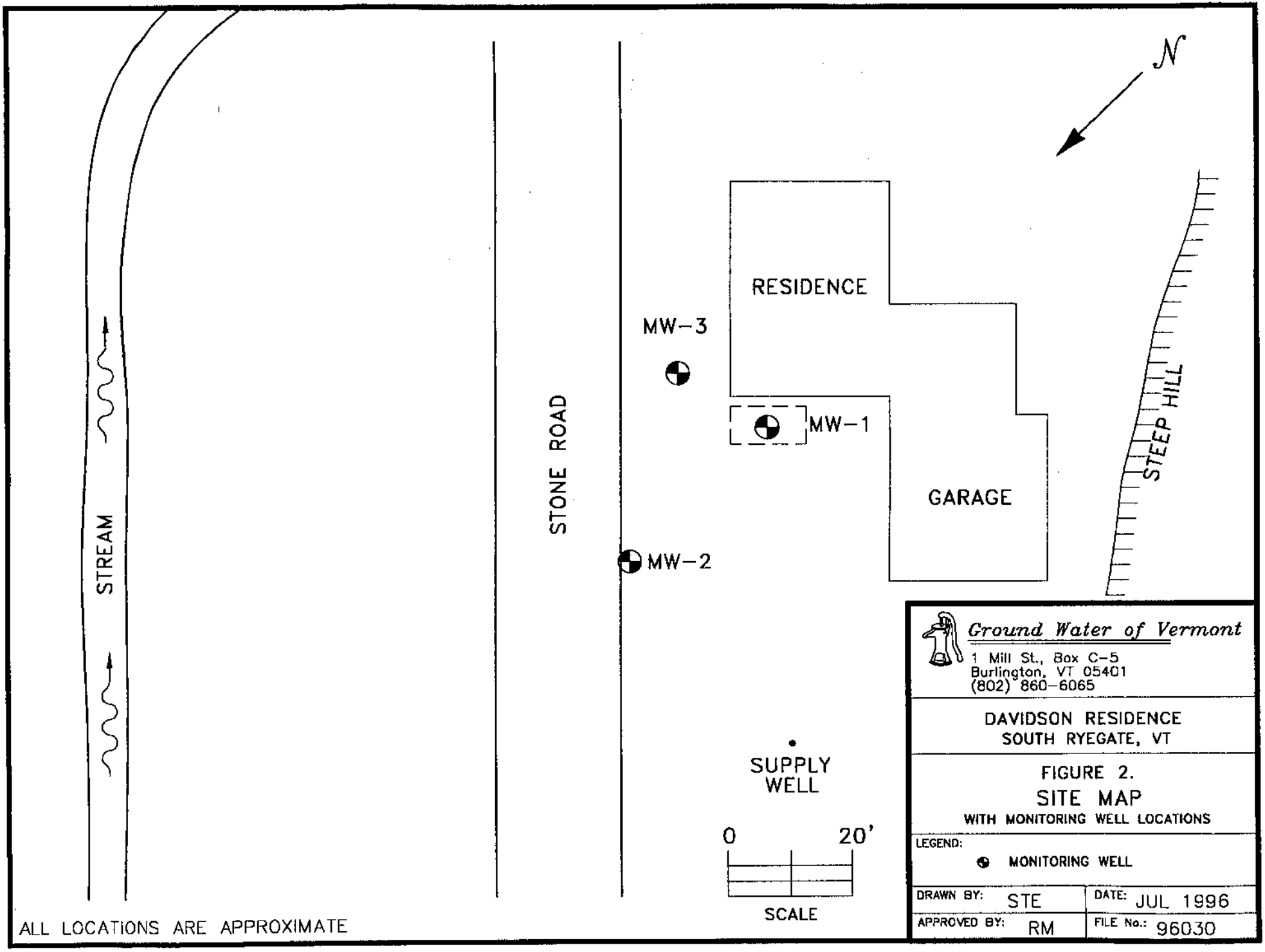
Fetter, C.W., 1994. *Applied Hydrogeology, 3rd Ed.*, Prentice Hall, Englewood Cliffs, New Jersey, 691 p.

Stewart, D.P. and MacClintock, P., *1970. Surficial Geologic Map of Vermont*, Office of the State Geologist.

APPENDIX A

Figures and Tables


Davidson Residence
Ground Water of Vermont
TITLE:
FIGURE 1. SITE LOCATION MAP
Source: USGS Topographic Map,
Groton, VT, Quadrangle 7.5' Series, 1973.
SITE:
Davidson Residence
SCALE:
1" = 20
DATE:
7/15/96
#962019
QUADRA
Clark
Substation
Ford
Wells
Whitcher Mtn
Quarry
South Ryegate
River
Melvin Hill
Swamp
Brook



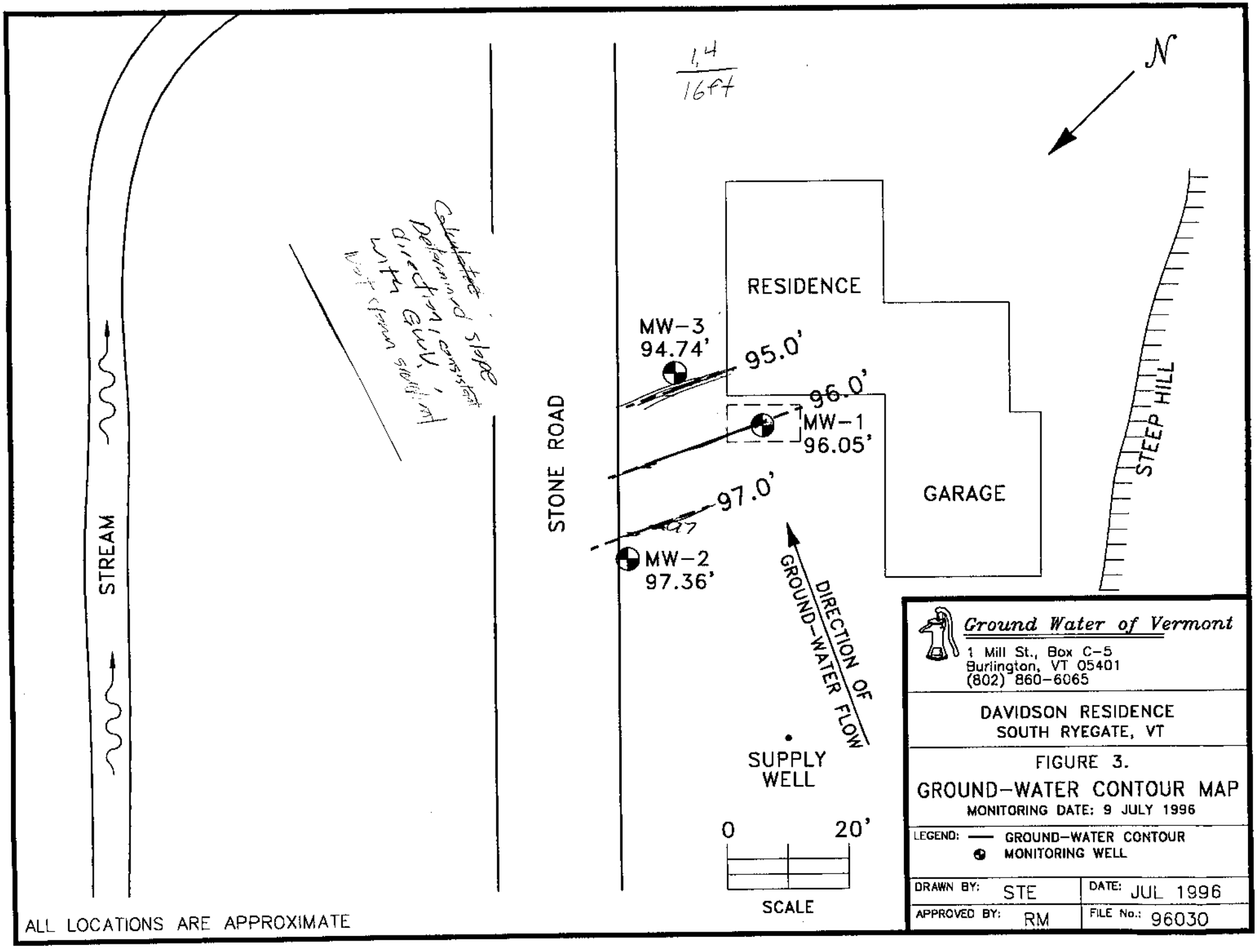
Ground Water of Vermont
1 Mill St., Box C-5
Burlington, VT 05401
(802) 860-6065

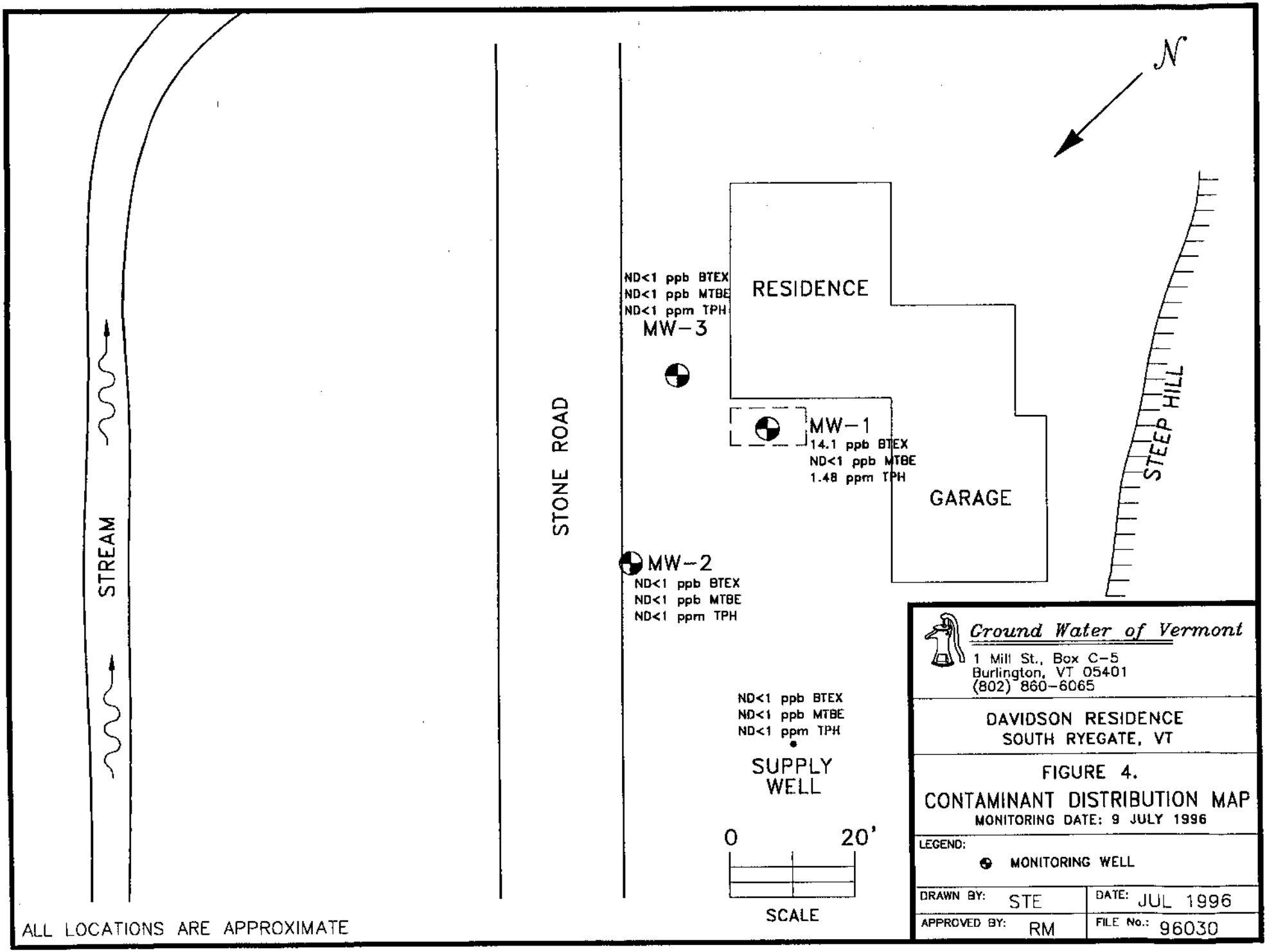
DAVIDSON RESIDENCE
SOUTH RYEGATE, VT

FIGURE 2.
SITE MAP
WITH MONITORING WELL LOCATIONS

LEGEND:
● MONITORING WELL

DRAWN BY: STE	DATE: JUL 1996
APPROVED BY: RM	FILE No.: 96030


STREAM
STONE ROAD
RESIDENCE
GARAGE
STEEP HILL
MW-3
94.74'
MW-1
96.05'
MW-2
97.36'
95.0'
96.0'
97.0'
DIRECTION OF GROUND-WATER FLOW
SUPPLY WELL
0
20'
SCALE
N
ALL LOCATIONS ARE APPROXIMATE
Ground Water of Vermont
1 Mill St., Box C-5
Burlington, VT 05401
(802) 860-6065
DAVIDSON RESIDENCE
SOUTH RYEGATE, VT
FIGURE 3.
GROUND-WATER CONTOUR MAP
MONITORING DATE: 9 JULY 1996
LEGEND: GROUND-WATER CONTOUR
MONITORING WELL
DRAWN BY: STE
DATE: JUL 1996
APPROVED BY: RM
FILE No.: 96030



Ground Water of Vermont
1 Mill St., Box C-5
Burlington, VT 05401
(802) 860-6065

DAVIDSON RESIDENCE
SOUTH RYEGATE, VT

FIGURE 4.
CONTAMINANT DISTRIBUTION MAP
MONITORING DATE: 9 JULY 1996

LEGEND:
⊕ MONITORING WELL

DRAWN BY: STE	DATE: JUL 1996
APPROVED BY: RM	FILE No.: 96030

TABLE 1. GROUND-WATER ELEVATION CALCULATIONS

Davidson Residence
South Ryegate, VT

Monitoring Date: 9 July 1996

Well I.D.	Top of Casing Elevation	Depth to Product	Depth to Water	Product Thickness	Corrected Depth to water	Water Table Elevation
MW-1	99.86	-	3.81	-	-	96.05
MW-2	100.00	-	2.64	-	-	97.36
MW-3	99.38	-	4.64	-	-	94.74

All values reported in feet relative to arbitrary datum.

APPENDIX B

Soil Boring and Well Construction Logs

Ground Water of Vermont

FIELD SUPERVISOR Brian Starr
CONTRACTOR Jack Oil
DRILLERS

JOB LOCATION Davidson Res. S. Ryegate
DATE 6/5/96

DRILLING METHOD Excavator
BORING DIAMETER

AND 40 – 50%
SOME 10 – 40%
TRACE 0 – 10%

BORING LOCATION sketch on back or on-site plan with measurements

BORING # MW-1

TOTAL DEPTH 8'

DEPTH	SAMPLES	SAMPLE NUMBER	BLOWS PER 6" (0/6, 6/12, 12/18, 18/24)	REC.	SAMPLE DESCRIPTION	STRAT CHG	GENERAL DESCRIPTION	WELL DETAIL	DEPTH
					poorly sorted brown sand and gravel; few cobbles gray clay		0.7 ppm 132 ppm	Riser	
5'					poorly sorted brown sand		144 ppm 131 ppm	Screen Backfill	5'
10'							Well installed in excav. of 2,000 gal fuel oil UST removed 6/5/96		10'
15'									15'
20'									20'
25'									25'
30'									30'
35'									35'
40'									40'

MATERIALS USED	SIZE/TYPE	QUANTITY	MATERIALS USED	SIZE/TYPE	QUANTITY
WELL SCREEN	2" Sch 40 PVC	5'	GROUT		
SLOT SIZE	10 slot		BACKFILL		
RISER PIPE	2" Sch 40 PVC	3'	WATER USED		
GRADED SAND			STEAM CLEANER		
PELLET BENTONITE					
GRANULAR BENTONITE					

Ground Water of Vermont

FIELD SUPERVISOR Brian Sterer
CONTRACTOR Adams Engineering
DRILLERS J. Adams

JOB LOCATION Davidson Residence
DATE 7/2/96

DRILLING METHOD Vibratory
BORING DIAMETER 2.375"

AND 40 – 50%
SOME 10 – 40%
TRACE 0 – 10%

BORING LOCATION sketch on back or on-site plan with measurements
BORING # MW-2
TOTAL DEPTH 11.5'

DEPTH	SAMPLES	SAMPLE NUMBER	BLOWS PER 6" 0/6	6/12	12/18	18/24	REC.	SAMPLE DESCRIPTION	STRAT CHG	PID Readings in ppm GENERAL DESCRIPTION ppm = part per million	WELL DETAIL	DEPTH
							3.0	poorly sorted dark brown sand and gravel with a trace of silt ↓		dry 1.2ppm ~ ground water table ATD	riser / screen / sand	
5'							4.0			wet 1.0 ppm		5'
								gray glacial till w/a trace of gravel 2" or smaller in size ↓		damp 1.1 ppm		
10'							1.5			dry - tight material 0.8 ppm		10'
15'												15'
20'												20'
25'												25'
30'												30'
35'												35'
40'												40'

MATERIALS USED	SIZE/TYPE	QUANTITY
WELL SCREEN	010/ PVC	5'
SLOT SIZE	2"/PVC	5'
RISER PIPE	2"/PVC	1.5'
GRADED SAND	#1	2 gallons
PELLET BENTONITE	N/A	
GRANULAR BENTONITE	yes	1/2 gallon

MATERIALS USED	SIZE/TYPE	QUANTITY
GROUT	yes	
BACKFILL	yes	
WATER USED	no	
STEAM CLEANER	yes	

Ground Water of Vermont

FIELD SUPERVISOR Brian Storer
CONTRACTOR Adams Engineering
DRILLERS J. Adams

JOB LOCATION Davidson Residence
DATE 7/2/96

DRILLING METHOD vibratory
BORING DIAMETER 2.375"

BORING LOCATION
sketch on back or on-site plan with measurements

BORING # MW-3
TOTAL DEPTH 8.5'

AND 40 – 50%
SOME 10 – 40%
TRACE 0 – 10%

DEPTH	SAMPLES	SAMPLE NUMBER	BLOWS PER 6" (0/6, 6/12, 12/18, 18/24)	REC.	SAMPLE DESCRIPTION	STRAT CHG	PID Readings in ppm GENERAL DESCRIPTION (ppm = parts per million)	WELL DETAIL	DEPTH
				4.0	poorly sorted dark brown sand and gravel with a trace of silt		1.0 ppm dump – ν ground water table ATD	99.4	
5'				3.5	gray glacial till with a trace of gravel		wet 2.0 ppm 2" in size or smaller tight-dry 3.4 ppm	riser, bentonite, screen, #1 sand	5'
10'					refusal		Note: Black colored soils, the top 6" of till, but no petroleum odor		10'
15'									15'
20'									20'
25'									25'
30'									30'
35'									35'
40'									

MATERIALS USED	SIZE/TYPE	QUANTITY
WELL SCREEN	0.10"/PVC	5'
SLOT SIZE	2"/PVC	5'
RISER PIPE	2"/PVC	2.5'
GRADED SAND	#1	2 gallons
PELLET BENTONITE		
GRANULAR BENTONITE	yes	1/2 gallon

MATERIALS USED	SIZE/TYPE	QUANTITY
GROUT	yes	
BACKFILL	yes	
WATER USED	no	
STEAM CLEANER	yes	

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

REPORT OF LABORATORY ANALYSIS

CLIENT: GroundWater of Vermont
PROJECT NAME: Davidson Residence
REPORT DATE: July 16, 1996
DATE SAMPLED: July 9, 1996

PROJECT CODE: GWVT1368
REF.#: 91,138 - 91,142

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. Chain of custody indicated sample preservation with HCl.

All samples were prepared and analyzed by requirements outlined in the referenced method and within the specified holding times. All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced method. Blank contamination was not observed at levels affecting the analytical results.

Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate recovery data was determined to be within laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

enclosures

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: GroundWater of Vermont
PROJECT NAME: Davidson Residence
REPORT DATE: July 16, 1996
DATE SAMPLED: July 9, 1996
DATE RECEIVED: July 11, 1996
DATE ANALYZED: July 15, 1996

PROJECT CODE: GWVT1368
REF.#: 91,138
STATION: Duplicate
TIME SAMPLED: Not Indicated
SAMPLER: Brian Starer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	2.5
Toluene	1	5.5
Xylenes	1	6.7
MTBE	1	ND

Bromobenzene Surrogate Recovery: 105%

NUMBER OF UNIDENTIFIED PEAKS FOUND: >10

NOTES:
1 None detected

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: GroundWater of Vermont
PROJECT NAME: Davidson Residence
REPORT DATE: July 16, 1996
DATE SAMPLED: July 9, 1996
DATE RECEIVED: July 11, 1996
DATE ANALYZED: July 15, 1996

PROJECT CODE: GWVT1368
REF.#: 91,139
STATION: MW-1
TIME SAMPLED: 19:00
SAMPLER: Brian Starer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	1.9
Toluene	1	7.9
Xylenes	1	4.3
MTBE	1	ND

Bromobenzene Surrogate Recovery: 117%

NUMBER OF UNIDENTIFIED PEAKS FOUND: >10

NOTES:
1 None detected

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: GroundWater of Vermont
PROJECT NAME: Davidson Residence
REPORT DATE: July 16, 1996
DATE SAMPLED: July 9, 1996
DATE RECEIVED: July 11, 1996
DATE ANALYZED: July 13, 1996

PROJECT CODE: GWVT1368
REF.#: 91,140
STATION: MW-2
TIME SAMPLED: 18:20
SAMPLER: Brian Starer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	ND
Toluene	1	ND
Xylenes	1	ND
MTBE	1	ND

Bromobenzene Surrogate Recovery: 100%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: GroundWater of Vermont
PROJECT NAME: Davidson Residence
REPORT DATE: July 16, 1996
DATE SAMPLED: July 9, 1996
DATE RECEIVED: July 11, 1996
DATE ANALYZED: July 15, 1996

PROJECT CODE: GWVT1368
REF.#: 91,141
STATION: MW-3
TIME SAMPLED: 18:40
SAMPLER: Brian Starer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	ND
Toluene	1	ND
Xylenes	1	ND
MTBE	1	ND

Bromobenzene Surrogate Recovery: 107%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: GroundWater of Vermont
PROJECT NAME: Davidson Residence
REPORT DATE: July 16, 1996
DATE SAMPLED: July 9, 1996
DATE RECEIVED: July 11, 1996
DATE ANALYZED: July 13, 1996

PROJECT CODE: GWVT1368
REF.#: 91,142
STATION: Davidson Supply Well
TIME SAMPLED: 19:20
SAMPLER: Brian Starer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	ND
Toluene	1	ND
Xylenes	1	ND
MTBE	1	ND

Bromobenzene Surrogate Recovery: 105%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: GroundWater of Vermont
PROJECT NAME: Goss Co.
REPORT DATE: July 16, 1996
DATE SAMPLED: July 9, 1996
DATE RECEIVED: July 11, 1996
DATE ANALYZED: July 12, 1996

PROJECT CODE: GWVT1367
REF.#: 91,132
STATION: Trip Blank
TIME SAMPLED: 5:30
SAMPLER: Brian Starer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	1.1
Toluene	1	1.4
Xylenes	1	3.8
MTBE	1	ND

Bromobenzene Surrogate Recovery: 99%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

EPA METHOD 8020 LABORATORY REPORT

MATRIX SPIKE AND DUPLICATE LABORATORY CONTROL DATA

CLIENT: GroundWater of Vermont
PROJECT NAME: Davidson Residence
REPORT DATE: July 16, 1996
DATE SAMPLED: July 9, 1996
DATE RECEIVED: July 11, 1996
DATE ANALYZED: July 15, 1996

PROJECT CODE: GWVT1368
REF.#: 91,141
STATION: MW-3
TIME SAMPLED: 18:40
SAMPLER: Brian Starer

Parameter	Sample(ug/L)	Spike(ug/L)	Dup1(ug/L)	Dup2(ug/L)	Avg % Rec
Benzene	ND[1]	10	9.6	9.4	95%
Toluene	ND	10	10.1	9.9	100%
Ethylbenzene	ND	10	10.6	10.2	104%
Xylenes	ND	30	31.9	30.6	104%

NOTES:
1 None detected

GroundWater of Vermont

The Chace Mill, One Mill Street, Box C-5, Burlington, Vermont, 05401
(802)-860-6065 (802)-860-6076 Fax

CHAIN OF CUSTODY RECORD

91,138 — 91,146

LABORATORY

ANALYSIS STATUS:
_____ RUSH (2-DAY)
_____ PRIORITY (4-DAY)
X BEST AVAILABLE TIME

PROJECT NUMBER: U96-030
PROJECT NAME: Davidson Residence
PROJECT LOCATION: S. Burgate, VT
PROJECT MANAGER: Ron Miller
COLLECTED BY: Brian Starr
DATE: 7/9/96

GDVT 1568

PAGE 1 OF 1

SAMPLE ID	DATE	TIME	SAMPLE MATRIX	TYPE OF CONTAINER	# CONT.	PRESRVD
Duplicate	7/9	—	W	VOA + 250 ml glass 91,138	2	I/A
mw-1		700P		VOA + 250 ml glass 91,139	3	
mw-2		620P		91,140		
mw-3		640P		91,141		
Davidson Supply Well		720P		91,142		

ANALYSIS REQUESTED

METALS - PLEASE LIST: MA ( ) EP-TOX ( ) TCLP	OIL & GREASE: IR ( ) GRAV. ( )	VOLATILE ORGANICS: 624 ( ) 601 ( ) 602 ( ) 8010 ( ) 8015 ( ) 8020 & MTBE ( )	EXTRACTABLES: ACIDS ( ) B-N ( ) PCBs ( ) PESTS ( ) 608/8080	TSS ( ) TDS ( ) pH ( ) SPEC COND ( )	BACTERIA: SPC ( ) TOT COLI ( ) FEC COLI ( )	CYANIDE: AMEN ( ) TOT ( )	CL ( ) F ( ) SO4 ( )	NO3 ( ) NO2 ( ) NH3 ( )	TCLP: METALS ( ) VOLATILES ( ) PESTICIDES ( ) SEMIVOLATILES ( ) HERBICIDES ( )	OTHER: TPH by EPA 8100	OTHER
			X							X	
			X							X	
			X							X	
			X							X	

Trip Blank to be shared w/ U96-047

REMARKS

MATRIX
W = AQUEOUS
S = SOLIDS

PRESERVATIVE
I = ICED
A = ACIDIFIED (1:1 HCl 4 drops VOA 25 drop 250 ml)
B = BASE
N = SODIUM BISULFATE

RELINQUISHED BY	DATE	TIME	RECEIVED BY
	7/11/96	9:30	

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

REPORT OF LABORATORY ANALYSIS

CLIENT: GroundWater of Vermont
PROJECT NAME: Davidson Residence
DATE REPORTED: July 16, 1996
DATE SAMPLED: July 9, 1996

PROJECT CODE: GWVT1369
REF. #: 91,143 - 91,146

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody record.

Chain of custody indicated proper sample preservation.

All samples were prepared and analyzed by requirements outlined in the referenced methods and within the specified holding times.

All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced methods.

Blank contamination was not observed at levels affecting the analytical results.

Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate data was determined to be within Laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

enclosures

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

TOTAL PETROLEUM HYDROCARBONS (TPH) BY MODIFIED EPA METHOD 8100

DATE: July 16, 1996
CLIENT: GroundWater of Vermont
PROJECT: Davidson Residence
PROJECT CODE: GWVT1369
COLLECTED BY: Brian Starer
DATE SAMPLED: July 9, 1996
DATE RECEIVED: July 11, 1996

Reference #	Sample ID	Concentration (mg/L)[1]
91,143	MW-1 7:00 p.m.	1.48
91,144	MW-2 6:20 p.m.	ND[2]
91,145	MW-3 6:20 p.m.	ND
91,146	Davidson Supply Well 7:20 p.m.	ND

Notes:

1 Method detection limit is 1.0 mg/L.
2 None detected

GroundWater of Vermont
The Chace Mill, One Mill Street, Box C-5, Burlington, Vermont, 05401
(802)-860-6065 (802)-860-6076 Fax

CHAIN OF CUSTODY RECORD

LABORATORY

ANALYSIS STATUS:
____ RUSH (2-DAY)
____ PRIORITY (4-DAY)
_X_ BEST AVAILABLE TIME

PROJECT NUMBER: V96-030
PROJECT NAME: Davidson Residence
PROJECT LOCATION: S. Ryegate, VT
PROJECT MANAGER: Ron Miller
COLLECTED BY: Brian Stre
DATE: 7/9/96

GWVT 1369

ANALYSIS REQUESTED:
METALS - PLEASE LIST: MA ( ) EP-TOX ( ) (8)
OIL & GREASE: IR ( ) GRAV. ( )
VOLATILE ORGANICS: 624 ( ) 601 ( ) 602 ( ) 8010 ( ) 8015 ( ) 8020 & MTBE (X)
EXTRACTABLES: ACIDS ( ) B-N ( ) PCBs ( ) PESTS ( ) 608/8080 ( )
TSS ( ) TDS ( ) pH ( ) SPEC COND ( )
BACTERIA: SPC ( ) TOT COLI ( ) FEC COLI ( )
CYANIDE: AMEN ( ) TOT ( )
Cl ( ) F ( ) SO4 ( )
NO3 ( ) NO2 ( ) NH3 ( )
TCLP: METALS ( ) VOLATILES ( ) PESTICIDES ( ) SEMIVOLATILES ( ) HERBICIDES ( )
OTHER: TPH by EPA 8100
OTHER:

SAMPLE ID	DATE	TIME	SAMPLE MATRIX	TYPE OF CONTAINER	# CONT.	PRESRVD	METALS	OIL & GREASE	VOLATILE ORGANICS	EXTRACTABLES	TSS	BACTERIA	CYANIDE	Cl	NO3	TCLP	OTHER: TPH by EPA 8100	OTHER	REMARKS
Duplicate	7/9	—	W	VOA ~~+250~~	2	I/A				X									Trip Blank to be stored w/ V96-047
mw-1	↓	700P	↓	VOA + 250 ml glass 91,143	3	↓				X							X		
mw-2	↓	620P	↓	↓ 91,144	↓	↓				X							X		
mw-3	↓	640P	↓	↓ 91,145	↓	↓				X							X		
Davidson supply well	↓	720P	↓	↓ 91,146	↓	↓				X							X		

MATRIX
W = AQUEOUS
S = SOLIDS

PRESERVATIVE
I = ICED
A = ACIDIFIED (1:1 HCl 4drops VOA, 25drop 250ml)
B = BASE
N = SODIUM BISULFATE

RELINQUISHED BY	DATE	TIME	RECEIVED BY
[signature]	7/11/96	9:30	[signature]

GroundWater of Vermont

The Chace Mill, One Mill Street, Box C-5, Burlington, Vermont, 05401
(802)-860-6065 (802)-860-6076 Fax

CHAIN OF CUSTODY RECORD

LABORATORY

ANALYSIS STATUS:
____ RUSH (2-DAY)
____ PRIORITY (4-DAY)
X BEST AVAILABLE TIME

PROJECT NUMBER: V96-030
PROJECT NAME: Davidson Residence
PROJECT LOCATION: S. Burlington, VT
PROJECT MANAGER: Ron Miller
COLLECTED BY: Brian Stro
DATE: 7/9/96

ANALYSIS REQUESTED

SAMPLE ID	DATE	TIME	SAMPLE MATRIX	TYPE OF CONTAINER	# CONT.	PRESRVD	METALS - PLEASE LIST: NA ( ) EP-TOX ( ) TC	OIL & GREASE: IR ( ) GRAV. ( )	VOLATILE ORGANICS: 624 ( ) 601 ( ) 602 ( ) 8010 ( ) 8015 ( ) 8020 & MTBE (X)	EXTRACTABLES: ACIDS ( ) B-N ( ) PCBs ( ) PESTS ( ) 608/8080	TSS ( ) TDS ( ) pH ( ) SPEC COND ( )	BACTERIA: SPC ( ) TOT COLI ( ) FEC COLI ( )	CYANIDE: AMEN ( ) TOT ( )	CL ( ) F ( ) SO4 ( )	NO3 ( ) NO2 ( ) NH3 ( )	TCLP: METALS ( ) VOLATILES ( ) PESTICIDES ( ) SEMIVOLATILES ( ) HERBICIDES ( )	OTHER: TPH by EPA 8100	OTHER	REMARKS
Duplicate	7/9	—	W	VOA ~~40ml~~	2	HA				X									
mw-1		700P		VOA + 250 ml glass	3					X								X	
mw-2		620P								X								X	
mw-3		640P								X								X	
Davidson supply well		720P								X								X	

Trip Blank to be shared w/ V96-047

MATRIX
W = AQUEOUS
S = SOLIDS

PRESERVATIVE
I = ICED
A = ACIDIFIED (1:1 HCl 4drops VOA 25drop 250ml)
B = BASE
N = SODIUM BISULFATE

RELINQUISHED BY	DATE	TIME	RECEIVED BY
	7/11/96	9:30	

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 878-4333
FAX 879-7103

FAX

TO: Ron Miller

FROM Harry B. Locker HBL

DATE: July 18, 1996

RE: DATA INTERPRETATION

As you requested, I have reviewed the analytical data associated with the following samples:

The chromatographic signature of Davidson Residence MW-1 (Ref. No. 91,139) is substantially different from the corresponding trip blank (Ref. No. 91,132). Although the samples share similarities in the target compound regime, the profile of the heavier molecular weight species differs considerably. This difference is noted in the analytical report via the unidentified peaks, which were reported for MW-1.

Comparison of the Modified EPA 8100 chromatographic signature for Londonderry MW-1 (Ref. No. 91,154), with a variety of signatures of Petroleum standards, suggests a best match with #2 Fuel.

HBL:rb